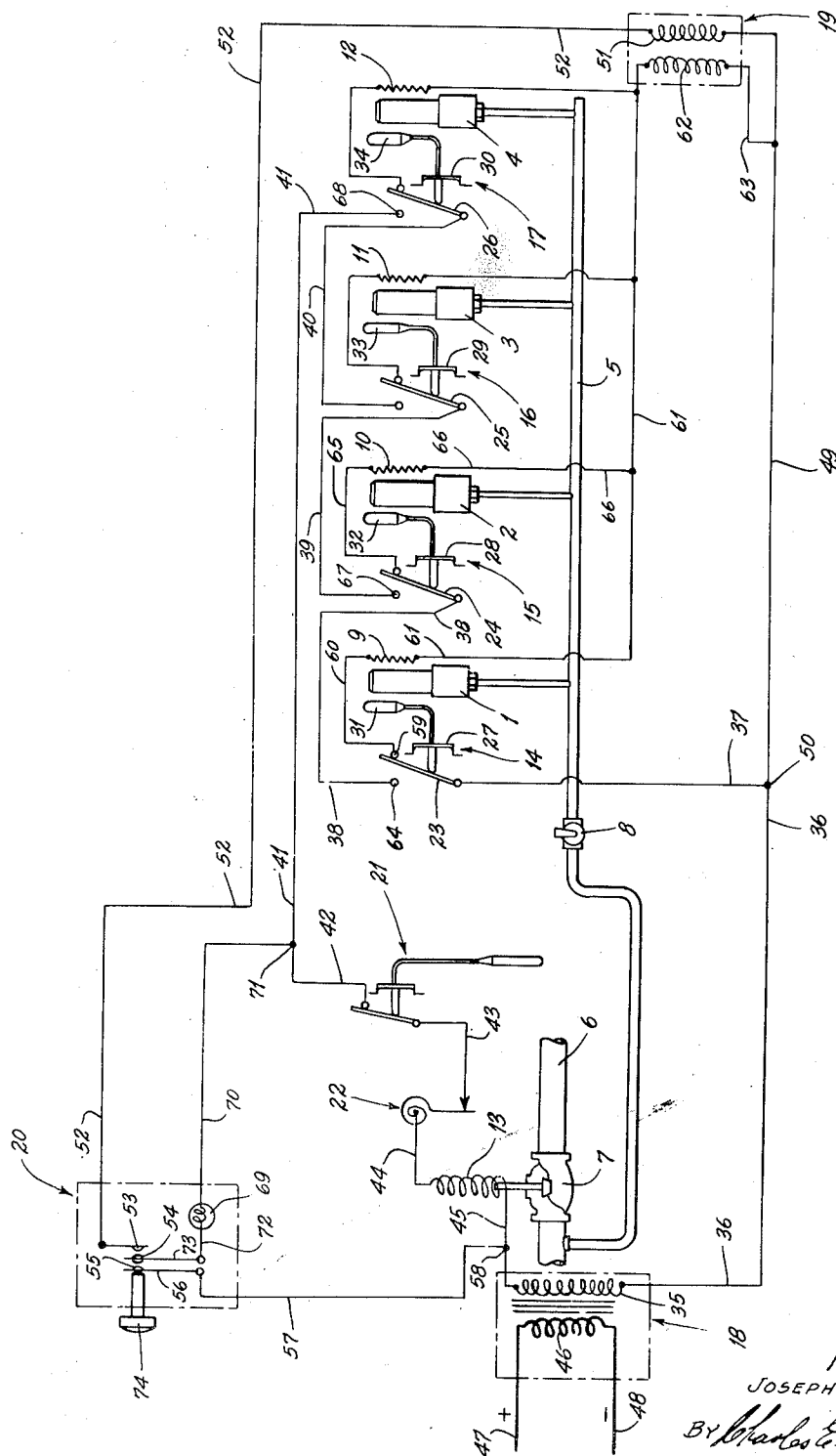


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 SEQUENTIALLY OPERATED IGNITER CONTROL SYSTEM
 FOR PILOT AND MAIN BURNERS
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SEQUENTIALLY OPERATED IGNITER CONTROL SYSTEM FOR PILOT AND MAIN BURNERS

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1

This invention relates to burner control systems, and has particular reference to a system including multiple pilot burner ignition devices.

It is an object of the invention to provide a simplified and economical burner control system for main and pilot burners which includes a plurality of pilot burner ignition devices and a main burner fuel supply control device, wherein the multiple ignition devices are under single point control, and wherein fuel is permitted to flow to the main burner only after successful ignition of all the pilot burners.

It is a further object of the invention to provide a burner control system including a plurality of electrically operated ignition devices for the individual ignition of multiple pilot burners, wherein the ignition devices are under single point control, and wherein the ignition devices are automatically energized individually and in sequence, by automatic switching devices responsive to the successful ignition of respective pilot burners after energization of a first ignition device is initiated by the single control.

A further object is to provide a system as above which includes means for indicating the completion of ignition of all pilot burners.

More specifically, it is an object to provide a system for the energization of a plurality of electrically operated igniters for multiple pilot burners employing a single step-up igniter transformer, having a circuit for its primary winding under the control of a single push button device, and having a circuit for its secondary winding which includes independent connections and automatic switching means individually responsive to flame at the respective pilot burners for sequentially connecting and disconnecting the igniters.

Further objects and advantages will appear from the following description and accompanying drawing.

The single figure of the drawing is a schematic view of one form of the present invention.

In the illustrated embodiment, multiple pilot burners are indicated at 1, 2, 3, and 4. Fuel is supplied to the pilot burners through a branch fuel line 5, which is connected to a main fuel supply line 6 at a point anterior to a main burner fuel supply control valve 7. There is a cock 8 in the branch 5 for the manual control of fuel to the pilot burners.

The pilot burners 1 to 4 are provided with resistance type igniters 9 to 12 respectively. The main burner fuel supply valve 7 is actuated by an electromagnetic device including a winding 13 and

2

is moved openward upon energization of this winding. The system further includes as primary elements: flame responsive switching devices generally indicated at 14, 15, 16 and 17, a main step-down transformer generally indicated at 18, an igniter step-up transformer generally indicated at 19, a push button control device generally indicated at 20, a heat production limit switch generally indicated at 21, and a space thermostat generally indicated at 22.

The automatic flame responsive switching devices 14 to 17 include flexible switch blades 23 to 26 respectively, which are normally in the position shown and which are moved in a counterclockwise direction by expansible elements 27 to 30 as flames issuing from the respective pilot burners contact the fluid filled temperature sensitive bulbs connected thereto and indicated at 31 to 34. The heat production limit switch 21, and the space thermostat 22 control the operation of a main burner (not shown) and are included with the main burner valve actuator winding 13 in a low voltage circuit comprising a main transformer secondary winding 35, a lead 36, a lead 37, switch blade 23, the lead 38, switch blade 24, the lead 39, switch blade 25, a lead 40, switch blade 26 and the leads 41, 42, 43, 44 and 45. A source of power is supplied to the main transformer primary winding 46 by the commercial leads 47 and 48. Connected in parallel with the low voltage circuit just described is an igniter transformer circuit comprising a lead 49 connected at 50 to the lead 36, the igniter transformer primary winding 51, a lead 52, push button contacts 53, 54 and 55, switch blade 56, and a lead 57 which is connected to the lead 45 at 58.

When there is no flame at the pilot burners the switch blade 23 at burner 1 will be in the position shown, completing an igniter transformer secondary circuit as follows; a lead 37, connected to the low voltage circuit at 50, switch blade 23, a contact 59, a lead 60, the igniter 9, a lead 61, the igniter transformer secondary winding 62, a lead 63, and the lead 49. Upon ignition of burner 1 switch blade 23 is moved counterclockwise first breaking the circuit for the igniter 9 and then engaging a contact 64, thereby completing an energizing circuit for igniter 10 which comprises the lead 37, switch blade 23, contact 64, the lead 38, the switch blade 24, a lead 65, igniter 10, a lead 66, the common lead 61, the igniter secondary winding 62, the lead 63, and the lead 49. As burner 10 is ignited switch blade 24 will in turn be moved counterclockwise to break the circuit for igniter 10 and thereafter

to engage a contact 67 to complete an energizing circuit for igniter 11. Circuits for the igniters 9 to 12 are thus sequentially completed and broken.

As the switch blade 26 of the last switching device 17 is moved counterclockwise upon ignition of the last burner 4 it breaks the energizing circuit for igniter 12 and then engages a contact 68, thus completing the low voltage circuit hereinbefore described. The winding 13 is now energized and fuel supplied to the main burner in accordance with requirements of the space thermostat 22 and under the control of the heat production limit switch 21.

An indicator light 69 is provided and is connected in parallel with the limit switch 21, the space thermostat 22 and the valve actuator winding 13. The connections are; a lead 70 connected to lead 41 at 71, the light bulb 69, a lead 72, a switch blade 73, contacts 54 and 55, switch blade 56, and the lead 57, connected to lead 45, at 58. Switch blades 56 and 73 are flexible and are normally in the positions shown, and as the push button indicated at 74 is fully depressed, contacts 50, 51, and 52 are engaged.

In operation

In the diagram the fuel valves 7 and 8 are shown in a closed position, the flame sensitive switches are shown in their normal cold position, the limit switch 21 is closed and the space thermostat is in a closed, heat demand position. Under these conditions in order to ignite the pilot burners, the cock 8 is first opened admitting fuel thereto. The push button 74 is then fully depressed engaging contacts 53, 54 and 55, thereby completing a circuit for the energization of the igniter transformer primary winding 51. This circuit is traced as follows; push button contact 55, switch blade 56, lead 57, lead 45, main transformer secondary winding 35, lead 36, lead 49, igniter transformer primary winding 51, lead 52, and contacts 53 and 54.

The switch blade 23 being in the position shown completes the circuit hereinbefore described which includes the igniter 9 and the igniter transformer secondary winding 62, thus energizing igniter 9 for the ignition of burner 1. As the flame from burner 1 impinges the fluid filled bulb 31, the expandable element 27 will move the switch blade 23 counterclockwise to break the circuit for igniter 9 and to engage the contact 64, thus completing a circuit for igniter 10. The multiple pilot burners are therefore individually and consecutively ignited as the operator continues to hold the push button 74 depressed.

Upon successful ignition of the final burner, in this instance burner 4, the switch blade 26 will be rotated counterclockwise, first to break the final ignition circuit and then to engage the contact 68, to complete the low voltage circuit which includes the electromagnetic valve actuator winding 13. At the same time the indicator light circuit will be energized thus signalling to the operator that successful ignition of all burners has been accomplished, whereupon the push button may be released. It will be noted that the indicator light 69 is connected around the space thermostat, thereby permitting operation of the ignition devices even though the thermostat may be open.

The foregoing disclosure is intended to be illustrative and not limiting, the scope of the invention being set forth in the appended claims.

I claim:

1. In a control of the kind described in combination, a series of pilot burners, an electrically operated igniter adjacent each of said pilot burners, a source of electrical energy, the first igniter of the series having normally complete circuit connections with said source of energy, said normally complete connections including a first normally closed flame responsive switch sensitive to flame at the first pilot burner, normally incomplete and independent circuit connections with said source for each of the other of said igniters, each including a normally closed flame responsive switch sensitive to flame at a pilot burner, said switches being of the double throw type and each being arranged to respond to flame upon successful ignition of its respective pilot burner to first break the circuit connections for its respective igniter and to then complete the circuit connections for the next succeeding igniter, and a manual switch for controlling said source of energy.

2. In a control of the kind described, a plurality of pilot burners, an electrically operated igniter for each burner, a source of electrical energy, a flame responsive switch for each of said igniters sensitive to flame at a respective pilot burner, said switches each having a double throw switch blade, normally complete circuit connections with said source of energy for one of said igniters, said complete connections including the blade of one of said flame sensitive switches when in a normal no-flame position, normally incomplete and independent circuit connections for each of the other of said igniters, each of said incomplete connections including the blade of one of the other of said flame responsive switches when in a normal no-flame position, each of said switches being responsive to flame at its respective pilot burner to first break the circuit connections for its respective igniter and to then complete circuit connections for one of the other of said igniters, and a manual switching device for controlling said source of energy.

3. In a control of the kind described, a series of pilot burners, an electrically operated igniter for each burner, a source of electrical energy, an electrically operated indicator, a flame responsive switch for each of said igniters sensitive to flame at a respective pilot burner, said switches each having a double throw switch blade, the first igniter of the series having circuit connections with said source of energy which are completed thru the blade of the first switch in the series when in its normal no-flame position, normally incomplete and independent circuit connections for each of the other of said igniters each including the blade of one of the other of said switches when in its normal no-flame position, normally incomplete circuit connections with said source for said indicator, each of said switches except the last in the series being responsive to flame at its respective pilot burner to first break the circuit connections for its respective igniter and to then complete circuit connections for the next succeeding igniter, the last switch of the series being responsive to flame at the last pilot burner to first break the connections for its respective igniter and to then complete circuit connections for said indicator, and a manual switch for controlling said source of energy.

4. In a system for the sequential ignition of multiple pilot burners, a plurality of electrically operated ignition devices each adjacent a pilot

5

burner, a source of electrical energy, independent connectors for connecting one side of said igniters to one side of said source, means for individually and sequentially connecting the other side of said igniters to the other side of said source including a common connector, said common connector including a plurality of series connected flame responsive switches each being sensitive to flame at a pilot burner, said switches each including a double throw switch blade having a normal no-flame position in which said common connector is broken at that point and in which the other side of one of said igniters is connected to said common connector at that point, and being responsive to flame at its respective pilot burner to move its blade to a position in which said common connector is completed at that point and in which its respective igniter and said common connector are disconnected, and a normally open manual switch for controlling said source of energy.

5. In a system for the sequential ignition of multiple pilot burners, a plurality of electrically operated ignition devices each adjacent a pilot burner, a source of electrical energy, a first circuit receiving energy from said source and including a normally open manual switch, and an ignition transformer primary winding, a second circuit including an ignition transformer secondary winding, independent connectors for connecting one side of each igniter to said second circuit at one side of said secondary winding, and means for individually and sequentially connecting the other side of said igniters to said second circuit on the other side of said secondary winding including a common connector having a connection with said other side of said second circuit, a plurality of flame responsive switches arranged in series in said common connector each being sensitive to flame at a pilot burner, said switches each including a double throw switch blade having a normal no-flame position in which said common connector is broken at that point and in which the other side of one of said igniters is connected to said common connector, and each being responsive to flame at its respective pilot burner to move its blade to a position in which said common connector is completed at that point and in which its respective igniter and said common connector are disconnected.

6. In a system for the sequential ignition of multiple pilot burners, a plurality of electrically operated ignition devices each adjacent a pilot burner, a primary energizing circuit including an ignition transformer primary winding, a spring pressed normally open manual switch for controlling said primary circuit, a secondary circuit including an igniter transformer secondary winding, independent connectors for connecting one side of each igniter to one side of said secondary circuit, an electrically operated indicator, connecting means including contact means engageable upon closure of said manual switch for connecting one side of said indicator to one side of said primary circuit, and means for independently and sequentially connecting the other side of said igniters to the other side of said secondary circuit including a common connector having a connection with said other side of said secondary circuit, a plurality of flame responsive switches arranged in series in said common connector each being sensitive to flame at one of the pilot burners, said switches each including a double throw switch blade having a normal no-flame position for breaking said common connector at

6

that point and for connecting the other side of one of said igniters to said common connector, and each of said switches except the last one in the series being responsive to flame at its respective pilot burner to move its blade to a position for completing said common connector at that point and for disconnecting its respective igniter from said common connector, said last switch of the series being responsive to flame at its pilot burner to first break the connection between its respective igniter and said common connector and to then complete connections between said indicator and the other side of said primary circuit.

7. In a burner control system in combination, a plurality of pilot burners, an electrically operated igniter for each pilot burner, a primary energizing circuit including first and second parallels, a normally open manual switch in said first parallel, an electrically operated main burner fuel control device, and a plurality of series connected flame responsive switches in said second parallel, said fuel control device being operable upon energization to permit flow of fuel, said switches each being sensitive to flame at a pilot burner and each having a double throw switch blade having a normally open no-flame position with respect to said second parallel, a secondary circuit energized upon completion of said primary circuit, and means including the blades of said flame responsive switches when in a normal no-flame position for independently connecting said igniters in said secondary circuit, said switches each being responsive to flame at a respective pilot burner to break circuit connections for an igniter and to complete said second primary circuit parallel at that point.

8. In a burner ignition control system in combination, a plurality of pilot burners, an electrically operated igniter for each pilot burner, a primary energizing circuit including first and second parallels, an igniter transformer primary winding in said first parallel, an electrically operated indicator, and a plurality of series connected flame responsive switches in said second parallel, said switches each being sensitive to flame at a pilot burner and each having a double throw switch blade having a normally open no-flame position with respect to said second parallel, a manual switch for controlling said primary circuit, a secondary circuit including an igniter transformer secondary winding, and means including the blades of said flame responsive switches when in a normal no-flame position for independently connecting said igniters in said secondary circuit, said switches each being responsive to flame at a respective pilot burner to break circuit connections for an igniter and to complete said second primary circuit parallel at that point.

9. In a burner control system, a plurality of pilot burners, an electrically operated igniter for each pilot burner, a primary energizing circuit including an electrically operated main burner control device, and a plurality of series connected flame responsive switches, said switches each including a switch blade having a normally open no-flame position and each being sensitive to flame at a pilot burner to move its blade to a circuit closing position, a shunt around said main burner control and said flame responsive switches, an ignition transformer primary winding, and a manual switch in said shunt, an ignition transformer secondary winding, and means including contact means engageable by said switch blades

when in a normal no-flame position for independently connecting said igniters across said transformer secondary winding.

10. In a burner control system, a plurality of pilot burners, an electrically operated igniter for each pilot burner, a primary energizing circuit including an electrically operated main burner control device, and a plurality of series connected flame responsive switches, said switches each including a switch blade having a normally open no-flame position and each being sensitive to flame at a pilot burner to move its blade to a circuit closing position, a first shunt around said main burner control, an electrically operated indicator in said shunt, a second shunt around said flame responsive switches and said indicator, an ignitor transformer primary winding in said second shunt, a manual push-button switch for

simultaneously completing or breaking both shunts, an ignition transformer secondary winding, and means including contact means engageable by said switch blades when in a normal no-flame position for independently connecting said igniters across said transformer secondary winding.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,210,852	Falkenberg	Aug. 6, 1940